

Magnification in contemporary dental practice: The case of Kazakhstan

Madina A. Kurmanalina^{1*}, Aliya A. Taganyazova², Aigul M. Sumanova³, Zhanara A. Shabanbayeva⁴,
Gulnar K. Isaeva⁵, Dinara Zh. Maratova⁶

1. PhD, Department of Surgical and Pediatric Dentistry, West Kazakhstan Marat Ospanov State Medical University, Aktobe, Kazakhstan.
2. PhD, Department of Surgical and Pediatric Dentistry, West Kazakhstan Marat Ospanov State Medical University, Aktobe, Kazakhstan.
3. Assistant Professor, Department of Therapeutic and Surgical Dentistry, Astana Medical University, Nur-Sultan, Kazakhstan.
4. PhD, Department of Therapeutic and Surgical Dentistry, Astana Medical University, Nur-Sultan, Kazakhstan.
5. Assistant of Department of Surgical and Pediatric Dentistry, West Kazakhstan Marat Ospanov State Medical University, Aktobe, Kazakhstan.
6. Master, Department of Surgical and Pediatric Dentistry, West Kazakhstan Marat Ospanov State Medical University, Aktobe, Kazakhstan.

Abstract

Magnification is essential in modern dental microsurgery. Its benefits include better quality, improved working posture, reduced visual deterioration, and prevention of musculoskeletal pain due to adjusted ergonomics. The study aims to identify the adoption rate, preferences, and attitudes towards magnification devices among interns, residents, and dental practitioners in Kazakhstan. The e-questionnaire was sent to 200 interns, postgraduate residents, and experienced dental practitioners. The study ran from January 2021 to March 2021. The questions covered the following topics: work experience; the types of equipment; application area; attitudes towards the use of dental magnification. Data were analyzed through the statistical package IBM SPSS version 22.

Results show that 52.2% of respondents used magnification tools in clinical practice. TTL loupes were the most utilized device. 23.6% of the participants stated that they use magnification devices in endodontics and 14.3% in oral surgery. 50.0% of respondents agreed that dental magnification increases treatment quality, enhances vision comfort, saves time, and reduces muscle pain. While 14.8% reported that magnification leads to vision problems, neck pains, wrist pains and lower back pains.

More than half of respondents use magnification devices in daily practice. Most respondents believed that using dental magnification is beneficial and should be studied in dental school.

Clinical article (J Int Dent Med Res 2022; 15(1): 287-290)

Keywords: Dentistry, Magnification, Dental loupes.

Received date: 13 January 2022

Accept date: 14 February 2022

Introduction

Since invention of operating microscope in the 1970s and its introduction in endodontics by Dr G. Carr in the late 1980s, magnification became indispensable in medicine.¹ Magnification is recognized as essential for modern microsurgery in dentistry.² Its benefits include enhanced quality of treatment, improved working posture, reduced visual deterioration, and prevention of musculoskeletal pain through adjusted ergonomics.³ It is not a luxury, but a necessity and an expected standard.

Magnification devices are used for the diagnosis of caries and shallow cracks, restoration quality control, denture marginal fit check, surgical bone and soft tissue grafting procedures.^{4,5,6} It has a huge advantage in endodontics due to minimal invasive conservative access to the pulp chamber and canal orifices, the detection of hidden canals, especially the MB2 canal in maxillary molars, precision during canal retreatment, removal of sealing materials and separated instrument, avoiding perforations during endodontic surgery.^{7,8}

The most popular magnification devices in dentistry are magnifying lenses, loupes and dental operating microscope (DOM).⁹ Kazakhstan dentists willingly invest in such equipment despite its significant cost and additional training. Unfortunately, the preferences and attitudes of dental practitioners to visual

***Corresponding author:**

Ms. Madina Kurmanalina,
Department of Surgical and Pediatric Dentistry of West
Kazakhstan Marat Ospanov State Medical University.
E-mail: bio_med@inbox.ru

magnification are left without attention. Our research is a modest attempt to fill the gap and find out interests, attitudes, preferences, implementations of magnification in Kazakhstan. Also, the study aims to identify the adoption rate of magnification devices among interns, residents, and dental practitioners.

Materials and methods

The e-questionnaire was sent by e-mail to 200 interns, postgraduate residents, and experienced dental practitioners. The questionnaire consisted of 10 questions on work experience, equipment, application, attitudes towards dental magnification. The study was conducted from January 2021 to March 2021. The questionnaire clearly stated the purpose of the research project and all respondents signed consent for data processing. Approved by the ethical committee of M. Ospanov Medical University, the study also complied with the World Medical Association Declaration of Helsinki. Data were analyzed through the statistical package IBM SPSS version 22. Methods of descriptive statistics were used for the analysis of categorical variables. To identify relationships between variables, the chi-square test was applied. Statistical significance was accepted at $p < 0.05$.

Results

182 (91%) of 200 respondents submitted responses to the e-questionnaires. 18 respondents did not participate for an unknown reason. The response rate was 58.2% for women and 41.8% for men. Participants mean experience was 6.36 (SD.5.45) and mean age – 29.04 years (SD 6.00). The groups among the respondents included interns – 35.7%, residents – 24.2%, dental clinicians – 40.1% (see Table 1).

Variable	N	%
Gender		
Male	76	41.8
Female	106	58.2
Experience		
Intern	65	35.7
Resident	44	24.2
Dental clinicians	73	40.1

Table 1. Participants Demographics.

Our results showed that females (58.2%) used dental magnification more often than males (41.8%). However, the difference was not statistically significant ($p=0.142$). Also, there is no statistically significant difference ($p=0.221$) in using dental magnification among interns (30.5%), residents (28.4%) and dental clinicians (41.1%). It means that the adoption rate is evenly spread among the groups.

95 (52.2%) respondents reported that they consistently used magnification tools in clinical practice. 54 (56.8%) reported that TTL loupes are the preferred devices and 34 (35.8%) preferred Flip-Up loupes. Only 7 (7.4%) of participants use DOM which can be explained by its prohibitive cost.

Concerning additional training and information about magnification, participants reported that they received it from different sources. 42.9% received their learning in continuing education lectures. A statistically significant difference of $p < 0.05$ was detected in that group. 150 (82.4%) agreed that the use of magnification should be studied in dental school. Participants noted that they learnt about dental magnification from varied sources. Most respondents (42.9%) received training in continuing education courses. A statistically significant difference is $p < 0.05$ for this group as shown in Figure 1. 150 (82.4%) agreed that the use of magnification should be introduced in dental school programs.

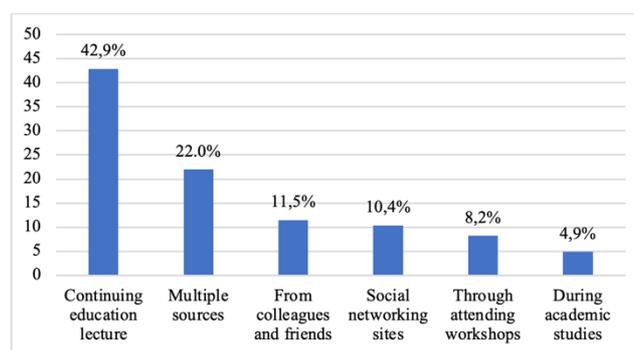


Figure 1. Sources of knowledge about dental magnification tools.

Participants opinions on the usage of magnification devices varied from skepticism to enthusiasm depending on the area of dentistry. Respondents noted that in various areas, the increased visual detail provided by magnification eliminates any confusion in

diagnosis and treatment planning, improves control in treatment delivery, permits a dentist to produce more ergonomic restorations, and ensured successful outcomes.

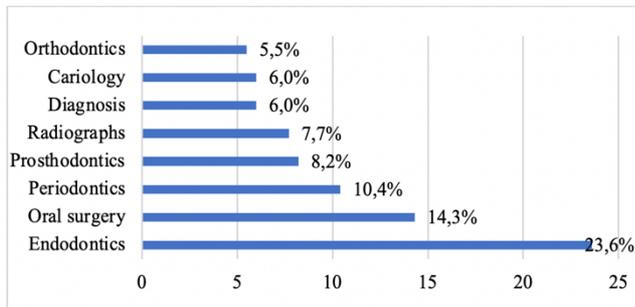


Figure 2. illustrates the usage of magnification devices in various areas of dentistry.

Figure 3 explains the barriers and difficulties which doctors encounter when adopting magnification.

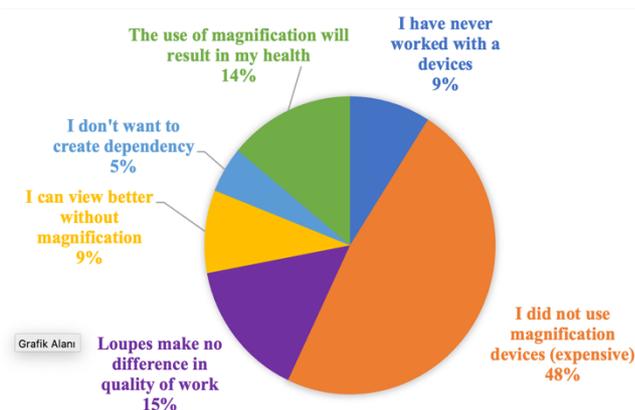


Figure 3. Barriers toward magnification usage.

Participants indicated various advantages and disadvantages to using magnification tools which are illustrated in Table 2.

	N	%
Advantages		
Vision comfort	29	15.9
Increase in treatment quality	91	50.0
Saves time	23	12.6
Reduces muscle pain	21	11.5
Disadvantages		
Vision problems	17	9.3
Neck pains	27	14.8
Wrist pains	8	4.4
Lower back pains	15	8.2

Table 2. Advantages and disadvantages of using dental magnification.

Discussion

Dentistry in Kazakhstan continues to develop to catch up with best world practices. More dental innovations and technologies are being adopted in dental practice every day. For example, ten years ago binoculars and DOM were a rarity while today they are widespread. Despite the significant cost, magnification tools are widely introduced in various branches of dentistry in Kazakhstan. It is a sign of progress and a testament to the desire of clinicians to improve the quality of treatment. Our study examined the preferences, rate of adoption, concerns, and attitudes toward dental magnification tools. The analysis showed that more than half (52.2%) respondents widely used magnification in clinical practice. However, the usage of optical devices was less than we expected.

Most participants (42.9%) learnt about magnification devices at continuing education programs. 22 % of respondents used multiple sources. The numbers (64.9%) are slightly higher than those obtained in the study conducted by Aboalshamat et al. according to which 60.25% dental practitioners learn about dental loupes from continuing education lectures.¹⁰ Other sources of information are colleagues (11.5%), social networking sites (10.4%), workshops (8.2%) and academic studies (4.9%). 48% respondents stated that the high cost of magnification equipment prevents its widespread use. It is similar to Saudi Arabia and India studies with 73.25% and 32.4%.^{10,11}

Only 15% of respondents stated that magnification makes no difference in work quality. 9% of practitioners responded that they see better without any magnification tools. 14% dentists are concerned with a negative impact on their vision. 5% of respondents believe that magnification devices create dependency. The same attitude was prevalent among 30% of Australian students who did not want to create visual dependency.¹² In the Saudi Arabia study 12.25% of respondents did not want to become reliant on magnification.¹⁰ US studies on objections to magnification also had the answer "don't want to create dependency".¹³

Most Kazakhstan dentists (63.2%) believed that dental magnification increases treatment quality, enhances vision comfort, saves time, and reduces pain. However, 36.8% stated that

magnification leads to vision problems, neck pains, wrist pains and lower back pains. Indeed, there is a risk of the negative impact of optical devices on the health of the dentist, but it can be avoided by proper selection of magnification tool, training and duration of use.^{14,15}

Most of the respondents (82.4%) believe that dental magnification should be studied in dental school. Statistic significant difference was found between responses of students and dental clinicians (28.7% vs. 46.0%, $p < 0.05$). The last were more confident in the required study of magnification tools in dental schools.

The question on the usage of magnification devices in various branches generated interesting answers. 23.6% of participants stated that they use magnification devices in endodontics and 14.3% – in oral surgery. The difference was statistically significant ($p < 0.05$). The obtained results are similar to the Saudi Arabia studies.^{10,16}

In terms of preferred tools, most doctors choose TTL despite Flip-Up loupes being cheaper. Doctors prefer TTL because they enable dentists and surgeons to work comfortably while maintaining comfortable neck position and optimal posture.

Conclusions

Adoption of magnification in dental practice automatically results in more precise dental work. Dentists can make more accurate and complete diagnoses and provide better treatment. In the presented study, most respondents stated that they knew about magnifying loupes, but their adoption usage in clinical practice is hindered by high cost and lack of training. The prospects are optimistic because Kazakhstan is halfway through towards adoption of magnification in dental practice. Our study encourages members of the dental community to implement magnification in their practice for the best outcomes.

Acknowledgements

The authors would like to gratefully acknowledge Department of Statistics for helping with data analysis.

Declaration of Interest

The authors report no conflict of interest.

References

1. Carr GB, Carlos AFM. The use of the operating microscope in endodontics. *Dent Clin N Am* 2010; 54(2): 191-214.
2. Low JF, Dom TNM, Baharin SA. Magnification in endodontics: A review of its application and acceptance among dental practitioners. *Eur J Dent* 2018; 12(04): 610-616.
3. Perrin P, Neuhaus KW, Lussi A. The impact of loupes and microscopes on vision in endodontics. *Int Endod J* 2014; 47(5): 425-429.
4. Perrin P, Eichenberger M, Neuhaus KW, Lussi A. Visual acuity and magnification devices in dentistry. *Swiss Dent J* 2016; 126(3): 222-235.
5. Hegde R, Hegde V. Magnification-enhanced contemporary dentistry: Getting started. *J Interdiscip Dent* 2016; 6(2): 91.
6. Popowicz W, Palatyńska-Ulatowska A, Kohli MR. Targeted endodontic microsurgery: computed tomography-based guided stent approach with platelet-rich fibrin graft: a report of 2 cases. *J Endod* 2019; 45(12): 1535-1542.
7. Low JF, Dom TNM, Baharin SA. Magnification in endodontics: A review of its application and acceptance among dental practitioners. *Eur J Dent* 2018; 12(04): 610-616.
8. Aqrabawi J, AL-Hadidi A, Zaghlal RA. The Use of Magnification, Loops, and Light Source in Daily Endodontic Practice. *J Int Dent Medical Res* 2021; 14(1): 350-359.
9. Pottammal N, Rao A, Natarajan S, Mahabala KY, Nayak A, Rao S. Defects Appearing to the Unaided Eye vs. Magnification in a Pediatric Rotary NiTi File. *J Int Dent Medical Res* 2021; 14(1): 87-92.
10. Aboalshamat K, Daoud O, Mahmoud LA, et al. Practices and attitudes of dental loupes and their relationship to musculoskeletal disorders among dental practitioners. *Int J Dent* 2020; 8828709.
11. Penmetsa GS, Mani LP, Praveen G, Dwarakanath CD, Suresh S. Awareness, Attitude, and Prevalence of usage of magnification devices among the dental practitioners in the state of Andhra Pradesh—A questionnaire-based study. *J Indian Soc Periodontol* 2017; 21(5): 398-402.
12. Hayes MJ, Rogers AA, Chuanon J, Tan T, Lai I, Yong E. Dental and oral health students' perceptions of loupes. *Int J Occup Saf Ergon* 2021; 27(1): 136-143.
13. Meraner M, Nase JB. Magnification in dental practice and education: experience and attitudes of a dental school faculty. *J Dent Educ* 2008; 72(6): 698-706.
14. Kamal AM, Ahmed DR, Habib SF, Al-Mohareb RA. Ergonomics of preclinical dental students and potential musculoskeletal disorders. *J Dent Educ* 2020; 84(12): 1438-1446.
15. Lietz J, Ulusoy N, Nienhaus A. Prevention of musculoskeletal diseases and pain among dental professionals through ergonomic interventions: a systematic literature review. *Int J Environ Res Public Health* 2020; 17(10): 3482.
16. Alhazzazi TY, Alzebiani NA, Alotaibi SK, et al. Awareness and attitude toward using dental magnification among dental students and residents at King Abdulaziz University, Faculty of Dentistry. *BMC Oral Health* 2017; 17(1): 1-7.